Trail Management 101

Course Objectives

- **Learn the process for :**
- Classifying and prioritizing trails
- Developing standards and specifications for trail work
- Inventorying and assessing trails
- Quantifying trail maintenance and rehabilitation workload and cost
- Prioritizing and scheduling trail projects
- Developing tool, equipment and material inventories

Course Objectives

- Securing and developing labor sources
- Evaluating and monitoring trail systems
- Continually adapting and improving your trail program

Trails traverse a wide variety of landforms and ecosystems






Trails are designed and constructed to meet the needs of different user groups

Urban hikers

Backpackers

Equestrians

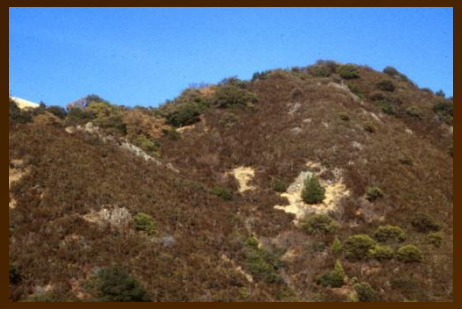
Mountain bikers

Multiuse

Off Highway Vehicles

Trail systems also include a variety of support facilities

How can we organize and manage such diverse and complex systems?



The organization of a trail system begins with classification of each trail

A trail matrix is used to evaluate each trail, identify its classification and establish its comparative rank or importance within the trail system

TRAIL NAME: _____

TRAIL CLASSIFICATION MATRIX

CRITERIA	Point Values	Rating
1. Accessible	25	
2. Interpretive	15	
3. Within Visitor Use Facility	15	
4. Equestrian and Bike (Multi Use)	15	
5. Adjacent to Visitor Use Facility		
0-1/4 mile	12	
1/4 - 1 mile	8	
1-2 mile	4	
2 or more miles	0	
6. Connection of Visitor Use Facilities	5	
7. Parking Access	5	
8. Destination Oriented		
0 - 1 mile	3	
1 -3 miles	2	
3 + miles	1	
9. Connection with Other Agency Trail	+3 - +5	
10. Special Use or Access	1	
11. Dead End Trail	0 or -3	
12. Loop or Connecting Trail	+1 - +3	
13. Fragile Environment		
Protected by lessening use	-1 - -3	
Protected by upgrading	+1 - +3	
14. Safety Factors		
a. Encourage less use by not Providing Improvements	-1 - -5	
b. Provide and maintain improvements	+0 - +5	
15. Staff Determined Use Patterns		
Little or no use	-1 - -3	
Higher use	+1 - +3	
	TOTALS	

CLASSIFICATION: II

I = 30+
II = 19 - 29
III = 10 - 18
IV = 0 - 9

TRAIL NAME: _____

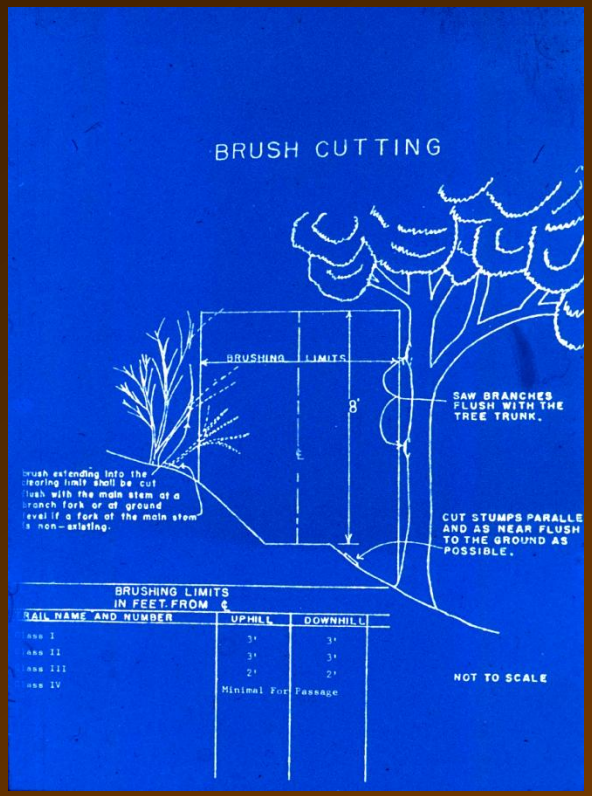
TRAIL CLASSIFICATION MATRIX

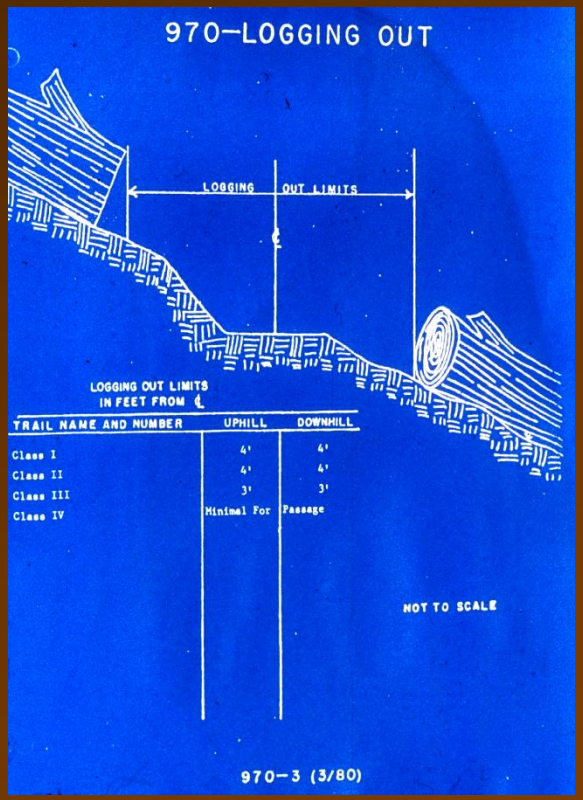
CRITERIA	Point Values	Rating
1. Accessible	25	
2. Interpretive	15	
3. Within Visitor Use Facility	15	
4. Equestrian and Bike (Multi Use)	15	
5. Adjacent to Visitor Use Facility		
0-1/4 mile	12	
1/4 - 1 mile	8	
1-2 mile	4	
2 or more miles	0	
6. Connection of Visitor Use Facilities	5	
7. Parking Access	5	
8. Destination Oriented		
0 - 1 mile	3	
1 -3 miles	2	
3 + miles	1	
9. Connection with Other Agency Trail	+3 - +5	
10. Special Use or Access	1	
11. Dead End Trail	0 or -3	
12. Loop or Connecting Trail	+1 - +3	
13. Fragile Environment		
Protected by lessening use	-1 - -3	
Protected by upgrading	+1 - +3	
14. Safety Factors		
a. Encourage less use by not Providing Improvements	-1 - -5	
b. Provide and maintain improvements	+0 - +5	
15. Staff Determined Use Patterns		
Little or no use	-1 - -3	
Higher use	+1 - +3	
	TOTALS	

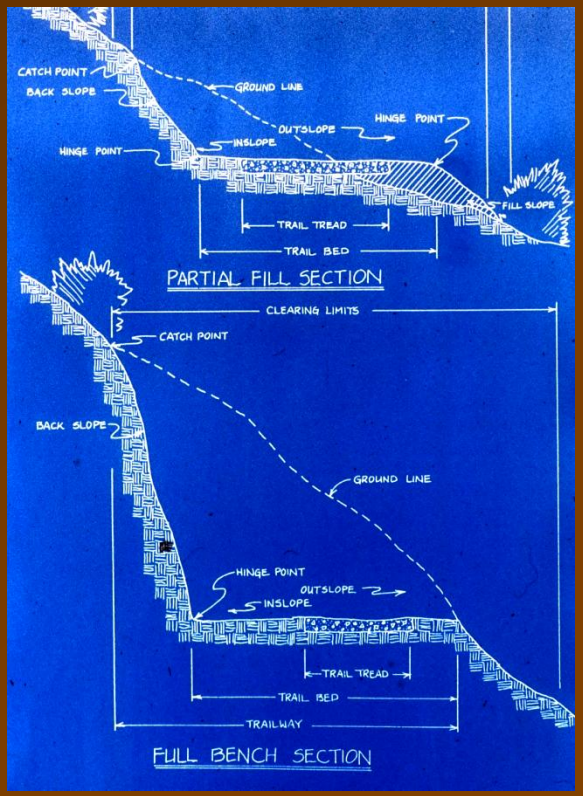
CLASSIFICATION: II

I = 30+
II = 19 - 29
III = 10 - 18
IV = 0 - 9

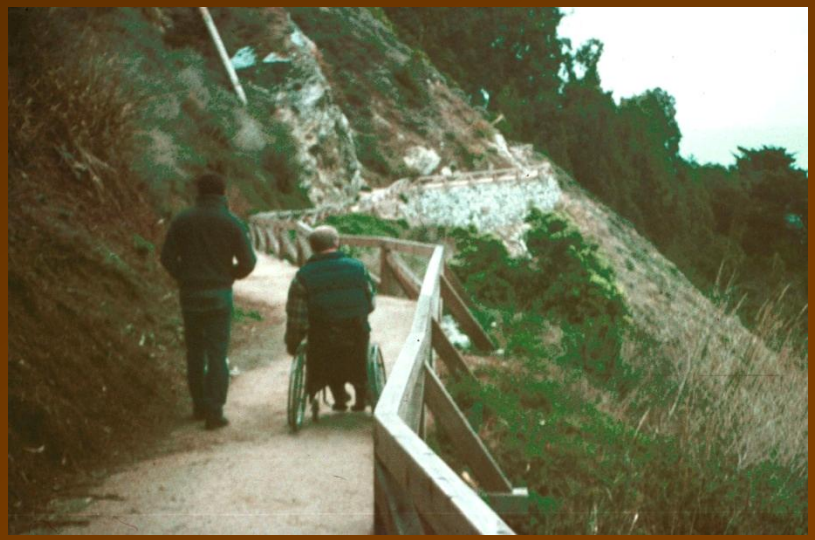
A set of design and construction standards is developed for each trail class.



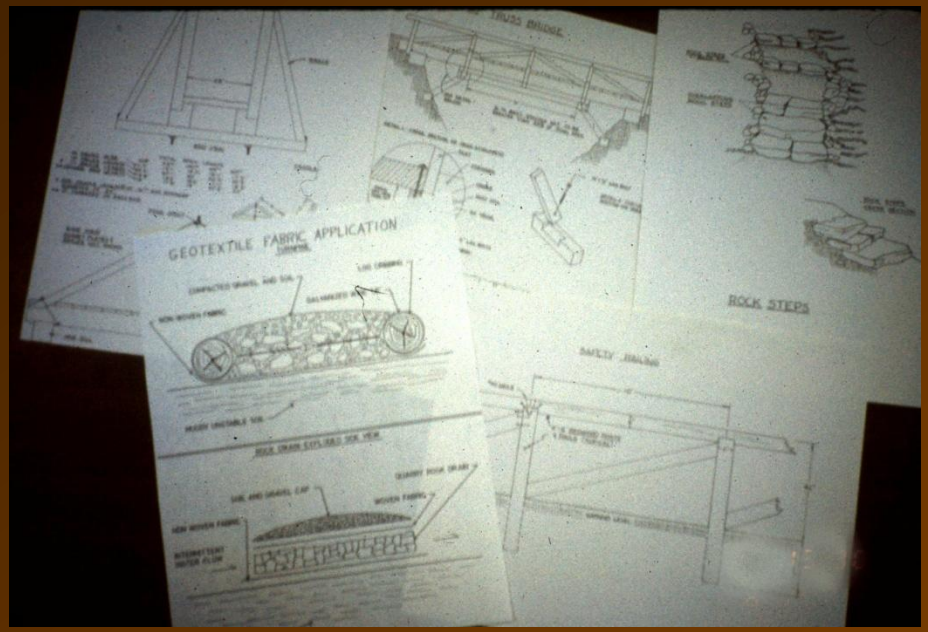




Specific design standards are also developed for the various user group trails

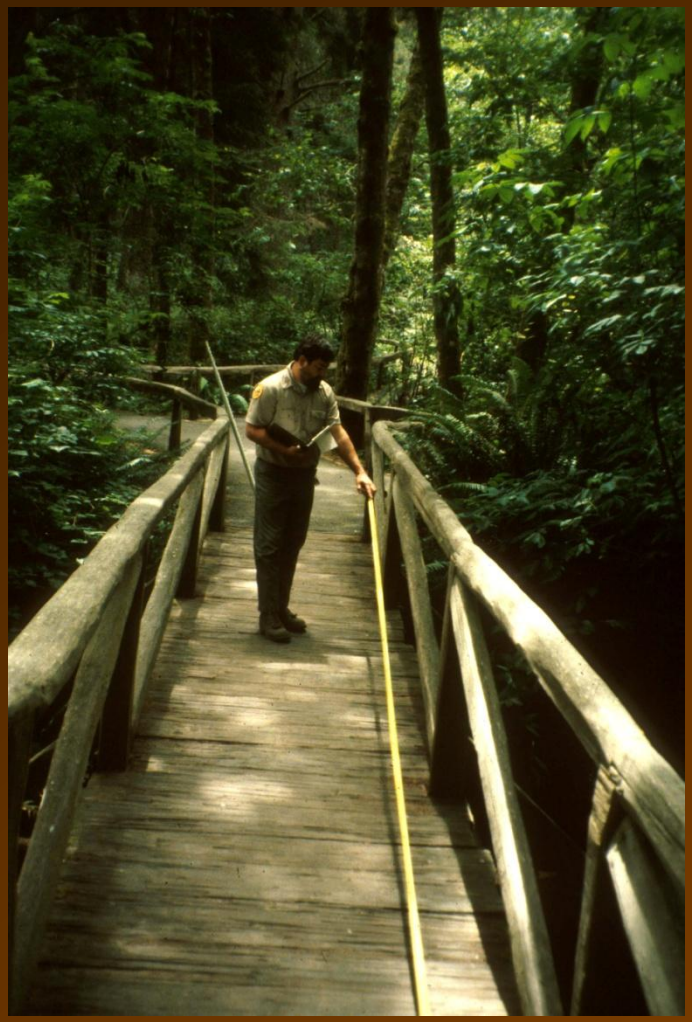


Once design and construction standards are developed the trail system can be inventoried and assessed using those standards



This can be accomplished by developing trail logs

Trail logs identify and quantify all trail features as well as trail deficiencies and their corrective prescriptions



When a trail is being assessed you must also determine if it is:

Not sustainable
but maintainable

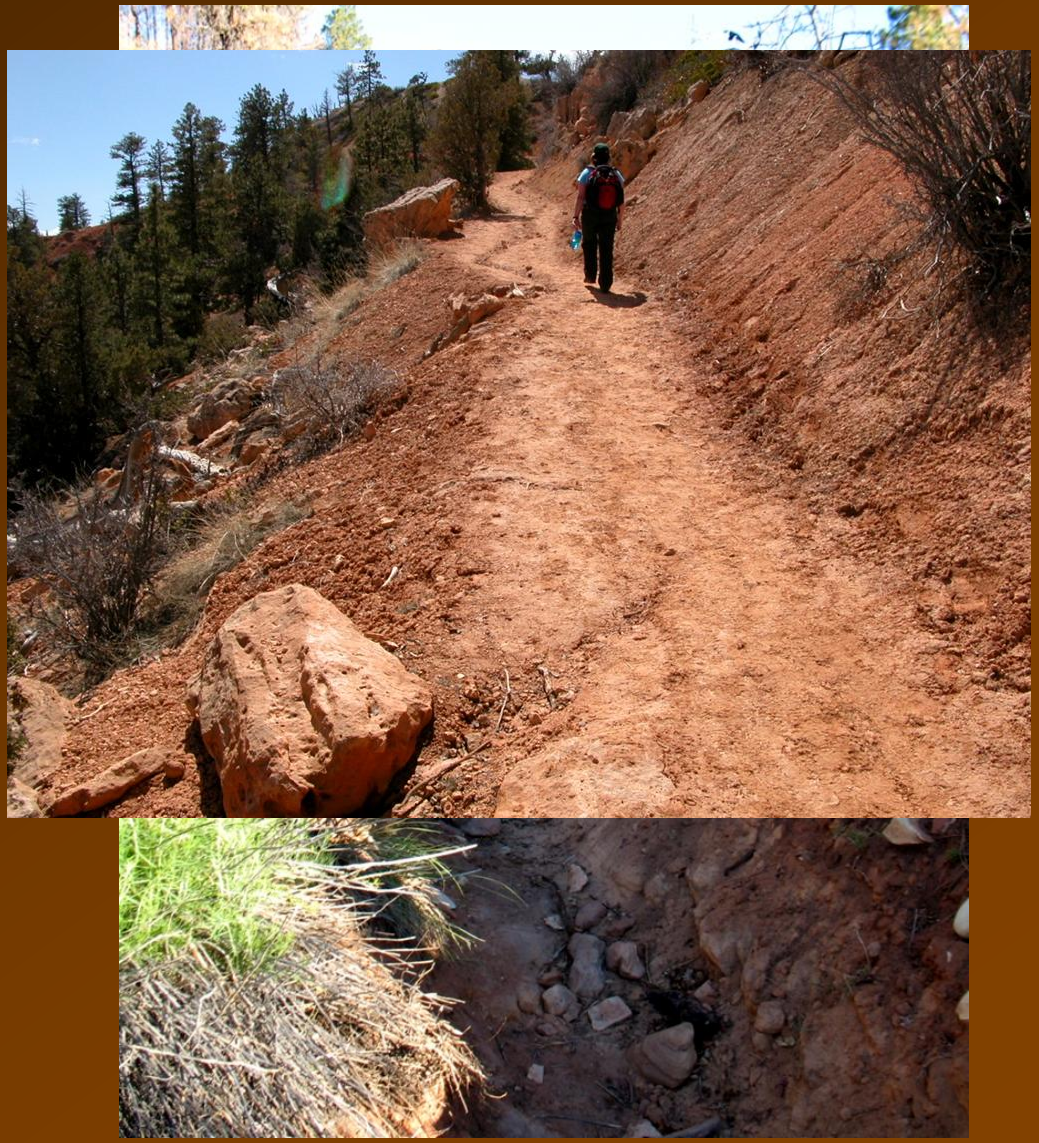
BEFORE (note yellow star for reference point)

NOW (note yellow star in same place for reference point)

Not sustainable or maintainable

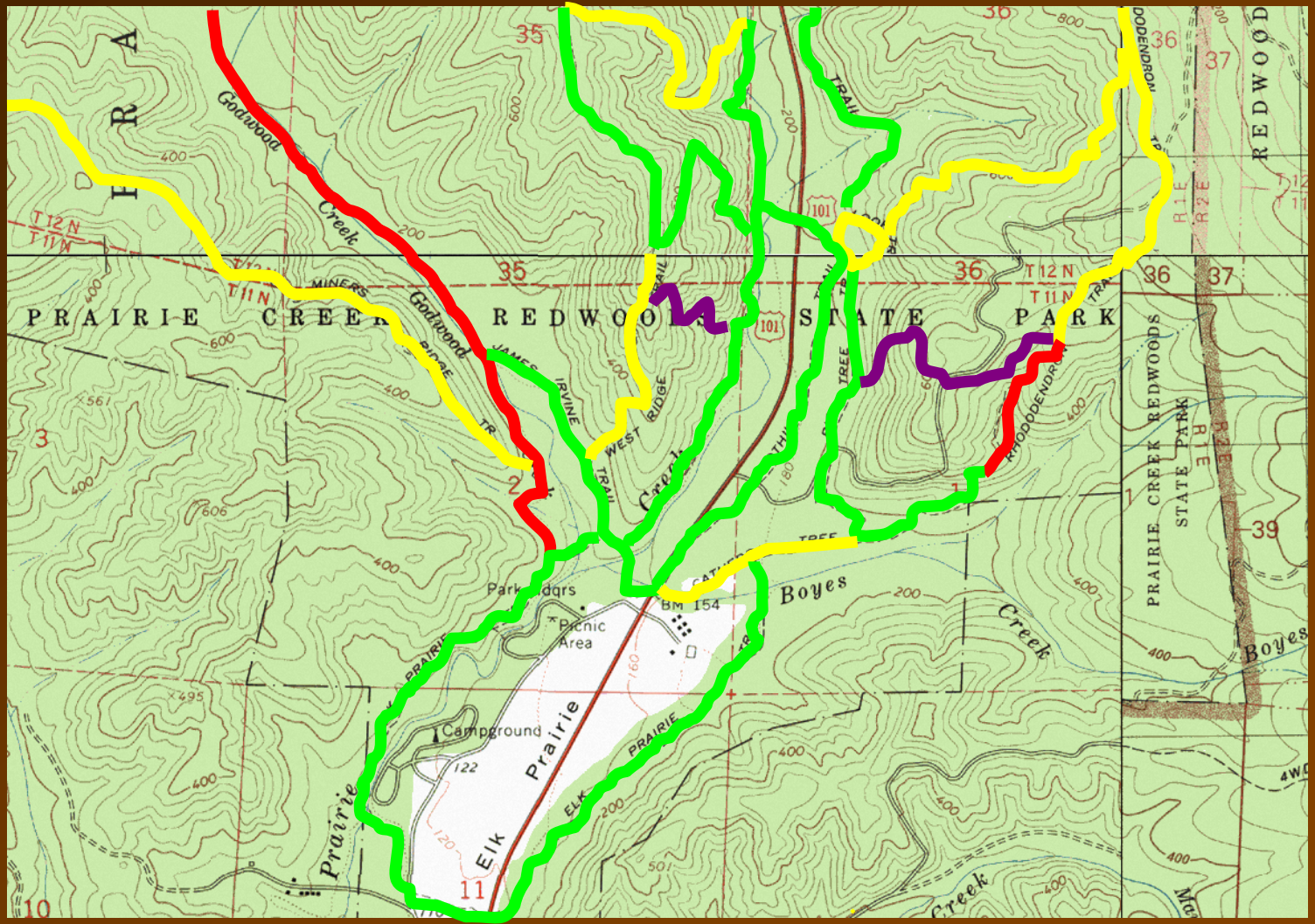
You must also determine the cause of the trails deficiencies

- Layout & Design
- Construction
- Maintenance



Once each trail is assessed it can be determined if the trail requires:

- **Maint.**
- **Recon.**
- **Reroute**
- **Removal**



Prescriptions for correcting theses deficiencies can be identified on the trail log or developed at a later date

The data collected from these inventories can then be sorted and used in electronic spreadsheets to calculate trail maintenance workload and cost

SCHEDULE FOR MAINTENANCE ☑ **OR HOUSEKEEPING** ☐

NAME OF FACILITY: Overlook | FEET: 363 | MI: 0.1 | WIDTH: 3 | FACILITY NO.: 123-F-2-03-1-002

JOB DESCRIPTION	DAILY TO ANNUAL CYCLE: DAILY TO ANNUAL PERSON HOURS		YEARLY TOTAL PH	YEARLY TOTAL MAT'L	2 TO 5 YEAR CYCLE: 2 YR	3 YR	4 YR	5 YR	NEXT 3 F.Y. SCHEDULED	TOTAL PH	TOTAL MAT'L	PERSONAL SERVICES: Class	PERSON HOURS
Safety Inspection	363	Feet Divided By 2 mile per Hour	0.03									PMS	0.03
123-20001-01-01		Hiking time or 10560 feet											
5002													
Yearly Brushing	363	Feet Divided by 500 feet per person hour	0.73	Contract		CCC			Contract	$13.00	per hour		
123-20009-02-01	1	year cycle between brushing		$10.62									
		Hiking and Travel Time	0.09										
5005									Planning and Supervison Hours			PMW II	0.12
Slough and Berm Maintenance	363	Feet Divided by 75 feet per person hour	0.97	Contract		CCC			Contract	$13.00	per hour		
123-20009-03-01	5	year cycle		$14.16									
		Hiking and Travel Time	0.12										
5006									Planning and Supervison Hours			PMW II	0.16
Down Tree Removal	0	Number of Down Trees from trail log divided by trail Age											
123-20009-04-01	20	Trail Age											
	0	Yearly Average of Down Trees		Contract		CCC			Contract	$13.00	per hour		
5008		times average of 1 hour per tree	0.00	$0.00									
		Hiking and Travel Time	0.00						Planning and Supervison Hours			PMW II	0.00
Miscelleanous Logging Out and Brushing Supplies	$1.58	Misc clearing and brushing supplies and equipment. 1 brush blade per mile plus saw chain and fuel.		$1.58									
Trail Reroute and Reconstruction	363	1% of trail tread on average											
123-20015-01-03	4	feet yearly divided by 7 feet per		Contract		CCC			Contract	$13.00	per hour		
		person hour equals hours annually	0.52	$7.58									
5020		Hiking and Travel Time	0.06										
									Planning and Supervison Hours			PMW II	0.09
ANNUAL TOTAL MATERIAL COST ALL PAGES:				**$117.19**					**TOTAL PERSON HOURS ALL PAGES**				**0.65**

TOTAL EQUIPMENT COSTS- FROM PAGE 4: $0

SCHEDULE PREPARED BY: meb | DATE: 2/20/02

Trail 473 Data Sheet			Trail Data Entry Area	TAB 473 #1	TAB 473 #2	TAB 473 #3	TAB 473 #4
Park or Sector:	BENBOW LAKE STATE RECREATION AREA		**Prepared By:**	meb	meb	meb	
Park or Sector Budget			**Date:**	2/20/02	2/20/02	2/20/02	
Materials and Contract:	$2,509.91		**Trail Name:**	Overlook	Pioneer	Pratt Mill	
Equipment Rental:	$0.00		**Park Unit:**	123	123	123	
			Classification Score:	1	1	1	
Total Trail Footage	11816		**Facility Number:**	123-F-2-03-1-002	123-F-2-03-1-001	123-F-2-04-1-001	
Personal Hours PMS	1.12		**Trail Length Ft:**	363	4245	7208	0
Personal Hours PMW II	20.82		**Trail Width in Feet (designed)**	3	3	3	3
			Trail Age Years(never less than 1):	20	20	20	20
Parkwide Trails Facility no:	123-F-2-03-1-003		**Material and Contract Total:**	$117.19	$935.85	$1,456.86	$0.00
			Equipment Rental Total:	$0	$0	$0	$0
			Personal Hours PMS:	0.03	0.40	0.68	0.00
			Personal Hours PMW II:	0.62	8.08	12.12	0.00

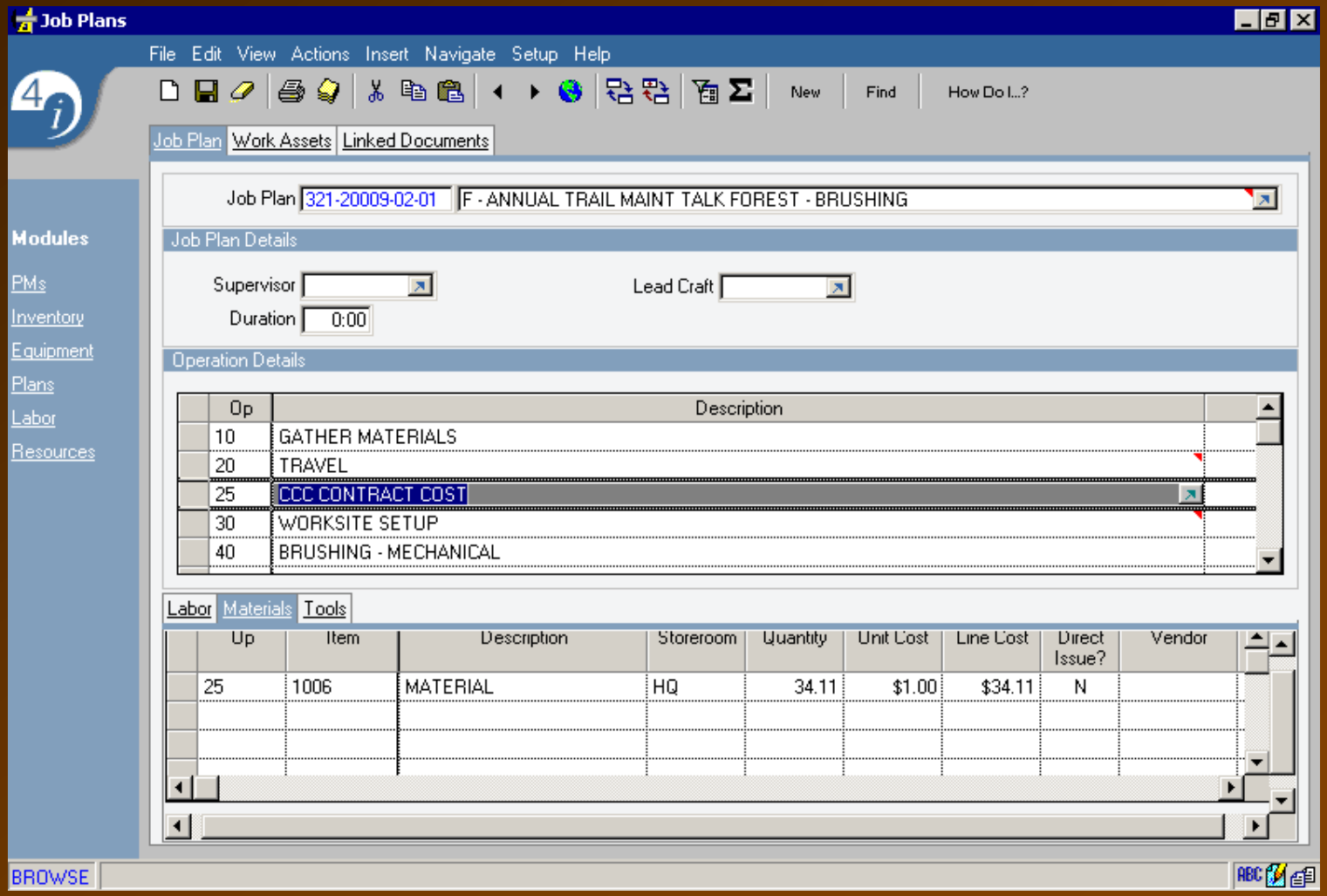
Material and Labor Cost Sheet

Item	Unit	Cost
CCC Contract Labor Cost	hour	$13.00
Brush Blades	each	$23.00
Saw Chain	foot	$0.80
Gravel	cubic yard	$25.00
Wood Step Material	board foot	$1.80
Wood Retaining Wall Material	board foot	$2.00
5/8" Rebar	lineal foot	$0.25
Hand Railing Material	board foot	$1.80
Split Rails	each	$22.00
Puncheon Replacement Costs	lineal foot	$50.00
Bridge Replacement Costs	lineal foot	$435.00
Laborer	hour	$15.20
Park Maintenance Worker I	hour	$16.58
Park Maintenance Worker II	hour	$19.66
Park Maintenance Supervisor	hour	$20.26
Type of Contractor, ie CCC CDF, Private, CYA ect		CCC
Geotextile Wall Fabric	square foot	$0.08
Cellular Wall Fabric	cubic foot	$2.75
Drain Lens Quarry Rock 3"-8"	cubic foot	$1.00
CMP Culvert 18"	lineal foot	$7.50
Seasonal Pipe Bridge	each	$850.00
Trail Bench	each	$750.00
4WD Trail Tractor	hour	$15.00
Motorized Wheelbarrow	hour	$2.50
450 Trail Dozer	hour	$19.00
Tilt Trailer	hour	$5.00

Equipment Item #1 page 1					
Equipment Item Needing to be rented					
When Needed (fall, winter, spring, summer)					
Cost for Equipment Rental	$0.00	$0.00	$0.00	$0.00	
Equipment Item #2 page 1					
Equipment Item Needing to be rented					
When Needed (fall, winter, spring, summer)					
Cost for Equipment Rental	$0.00	$0.00	$0.00	$0.00	
Equipment Item #1 page 2					
Equipment Item Needing to be rented					
When Needed (fall, winter, spring, summer)					
Cost for Equipment Rental	$0.00	$0.00	$0.00	$0.00	
Equipment Item #2 page 2					
Equipment Item Needing to be rented					
When Needed (fall, winter, spring, summer)					
Cost for Equipment Rental	$0.00	$0.00	$0.00	$0.00	

Trail Log Inventory Totals	Unit of Measure				
Brushing Cycle	years	1	1	1	1
Slough and Berm Maintenance Cycle	years	5	5	5	5
Down Trees	each		13	20	
Gravel Surfacing ie Turnpike and Causeway	lineal feet			525	
Standard Wood Steps	each				
Interlocking - Single	each				
Interlocking - Double	each				
Waterbar - wood	each				
Cable Steps	each				
Wood Retaining Wall (adbutments, turnpike w all, full & partial crib step retainers)	square feet		314	459	
Standard Wood Rails	lineal feet	50			
Split Rail Fences	lineal feet				
Mortar Rock Safety Walls	cubic feet				
Puncheons	each				
Puncheon Maintenance	lineal feet				

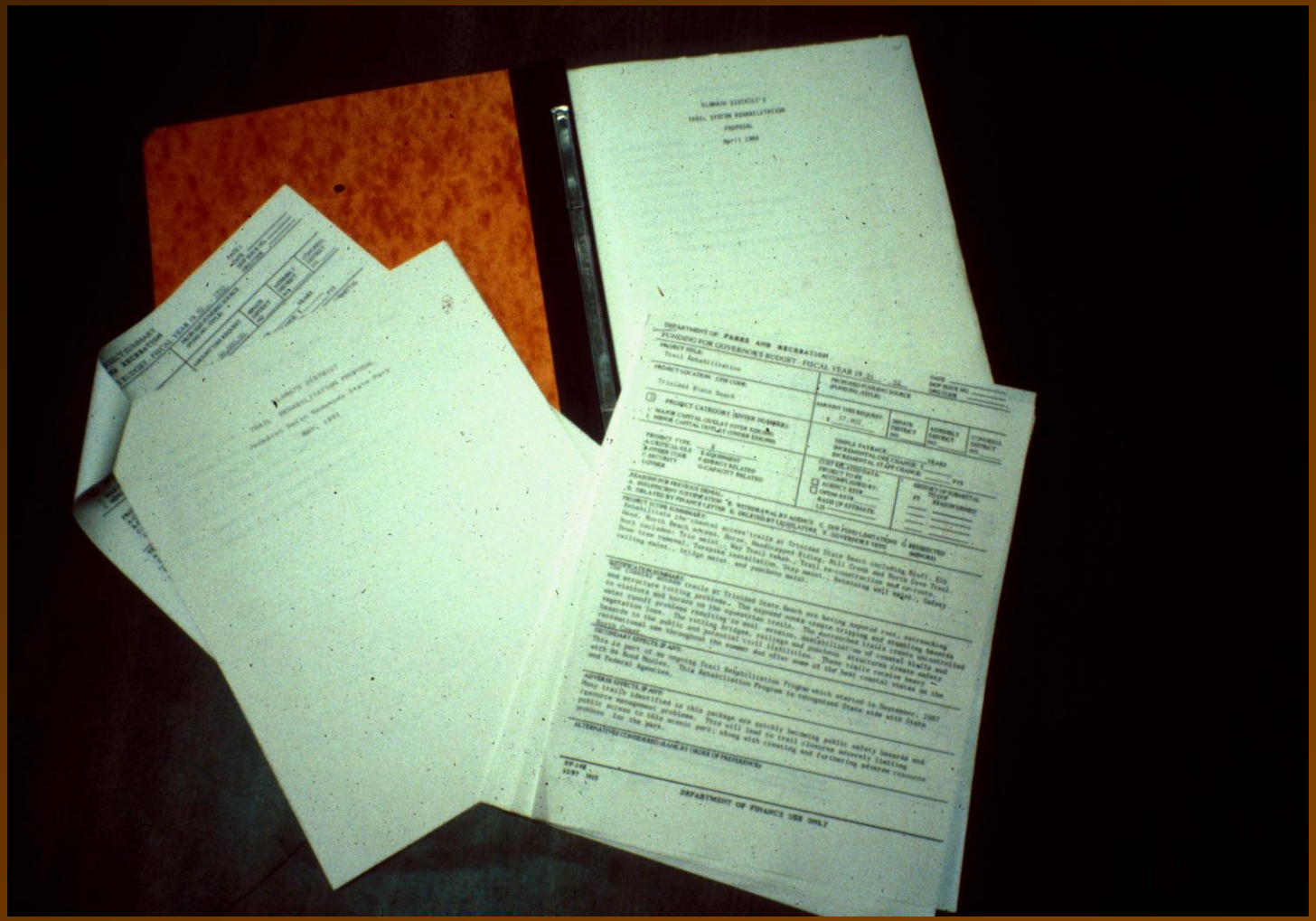
This data can be used in Maximo or other data base programs to justify annual trail maintenance budgets



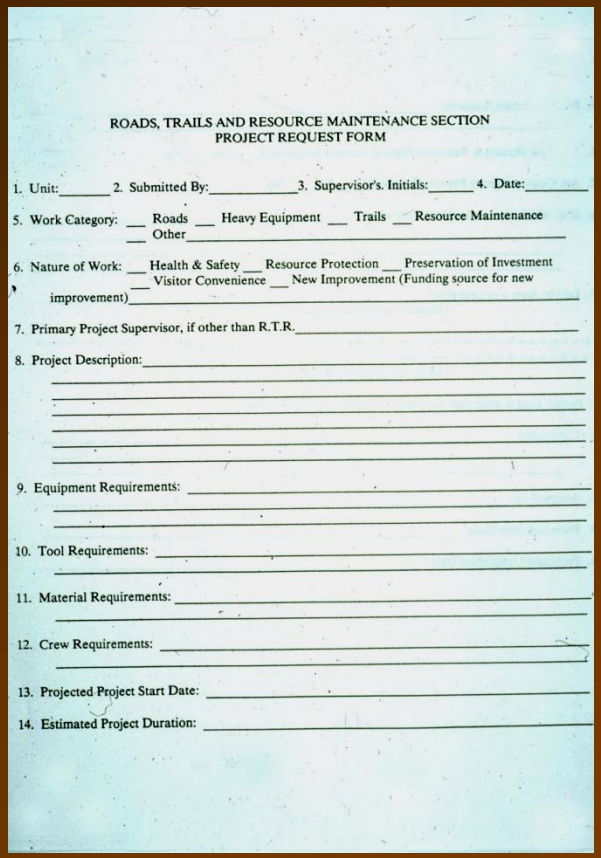
These inventories can also be used to quantify trail rehabilitation cost

								TRAIL:	James Irvine		
CONSTRUCTION ACTIVITY	**TOTALS**	**UNIT**			**PER UNIT COST**				**LABOR COST**	**MATERIAL COST**
Helicopter Rental	0		hrs	@	$8,000.00	=				$0.00
Mule Packing Contract	0		day	@	$125.00	=				$0.00
Spike Camps										
If Spike Camp Put "1" in Box If No Spike Camp Put "2" in Box	1									
Spike Camp Move-in Move-out Cost	2.00		ea	@	$750.00	=				$1,500.00
Spike Camp Overhead Costs	17.41		weeks	@	$750.00	=				$13,056.30
Cook Contract	4.35		month	@	$4,800.00	=				$20,890.08
Vehicle Cost (Crew Van/CCV)	4		month	@	$600.00	=				$2,611.26
Trail Crew Management Information									tax on materials	$4,654.23
Crew Size (number of workers)	10									
									Labor	**Materials**
Work Day Hours (8 or 10 hour days)	8								$83,888.00	$71,461.84
							Hiking Time		$5,243.00	
Average Daily Hiking Time on Project							**Total Labor**		$89,131.00	
Display in increments of 15 minutes at .25	0.50						**Supervision Cost**			$13,369.65
hours (ex .25, .50, .75, 1.00, 1.25, 1.50)							**Tool & Equipment Replacement**			$8,698.12
	Administrative Overhead Percentage							12%		$20,875.50
					TOTAL PROJECT COST					**$203,536.11**

This data can be used to secure trail rehabilitation funds through capital outlay request and grant proposals



Trail deficiencies identified through inspections and staff input are then prioritized. Prioritizing trail projects should be an objective process.



ROADS, TRAILS AND RESOURCE MAINTENANCE SECTION
PROJECT REQUEST FORM

1. Unit:_____ 2. Submitted By:_____3. Supervisor's. Initials:_____ 4. Date:_____

5. Work Category: __ Roads __ Heavy Equipment __ Trails __ Resource Maintenance
__ Other_____

6. Nature of Work: __ Health & Safety __ Resource Protection __ Preservation of Investment
__ Visitor Convenience __ New Improvement (Funding source for new improvement)_____

7. Primary Project Supervisor, if other than R.T.R._____

8. Project Description:_____

9. Equipment Requirements: _____

10. Tool Requirements: _____

11. Material Requirements: _____

12. Crew Requirements: _____

13. Projected Project Start Date: _____

14. Estimated Project Duration: _____

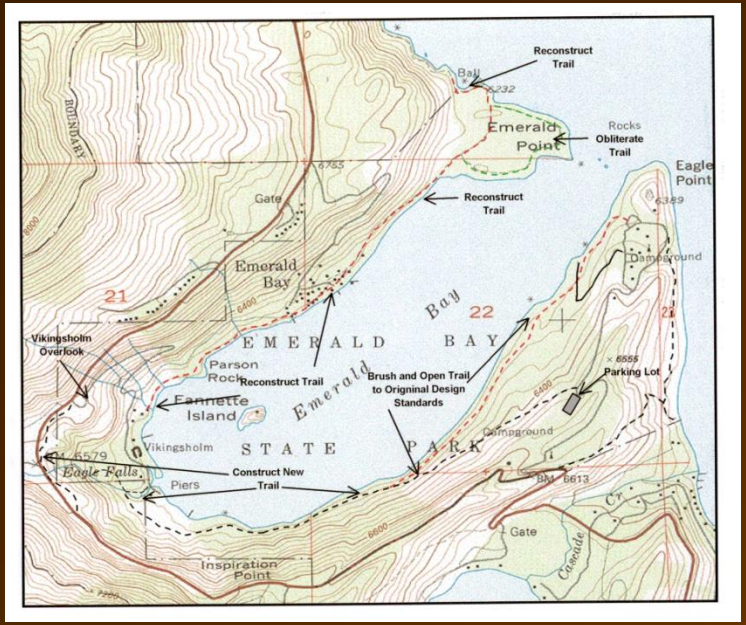
Health and safety

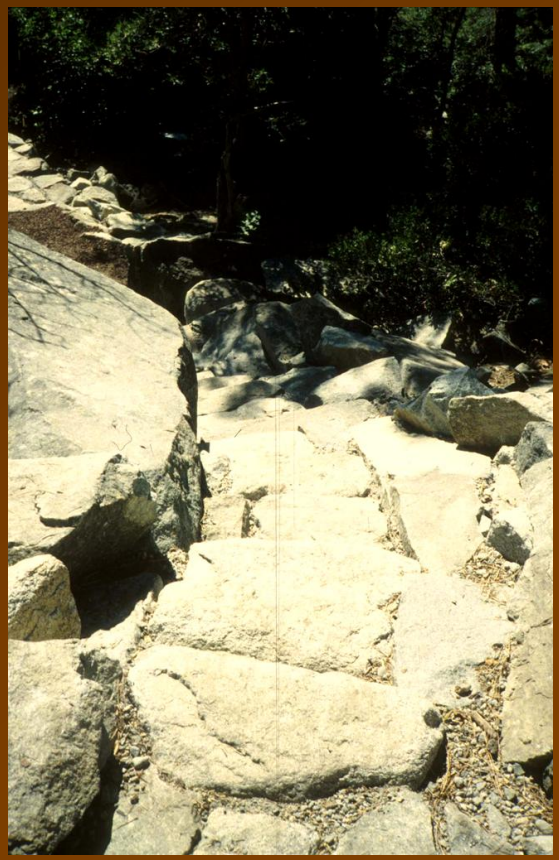
Resource protection

Preservation of investment

Visitor convenience

New trail development





For each of these categories points are assigned based on the severity of the problem.

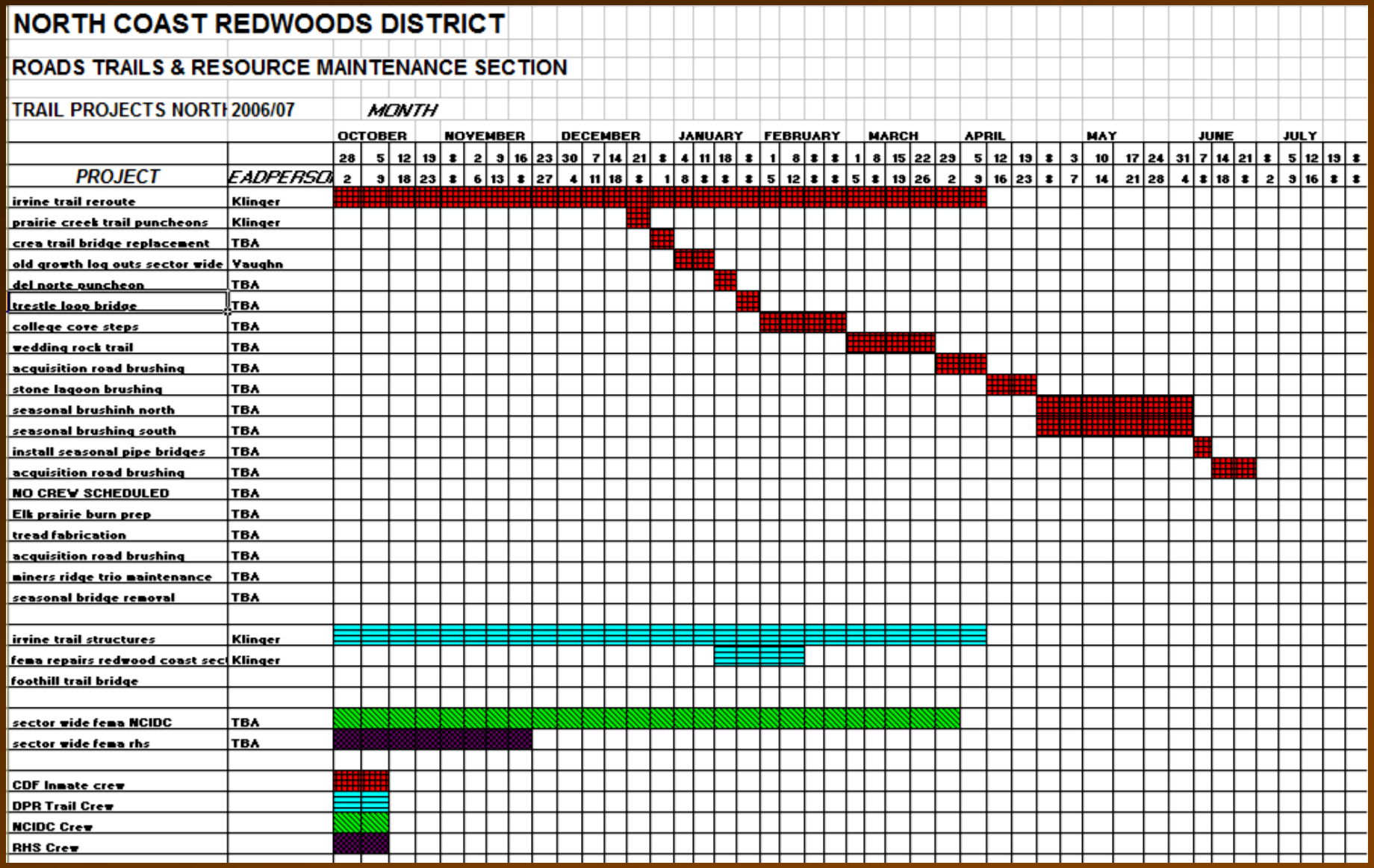
Trail Project Selection Matrix

	Qualifying Deficiency (select all that apply and rank it on the severity scale shown)							
Trail Project	Visitor Safety 1-10	Resource Protection 1-10	Preservation of Investment 1-7	Visitor Conveinenc e1-5	New Trail Construction 1-3	Total Matrix Points	Trail Class	Trail Class Points
West Ridge	5	6		4		15	3	19
Ten Taypo	8	10	2			20	3	18
Superintendent					2	2	2	22
South Fork	8	7				15	3	14
Rhododendron	5	6	3	2		16	3	18
Revelation			7			7	1	42
Ossagon	5	9				14	2	20
Little Creek		8		2		10	4	5
James Irvine	10	5	5			20	1	32
Foothill	10	6	4			20	2	25
Elk Prairie	8	7	5			20	1	38
Clintonia			6	2		8	3	15
Cathedral Trees			7	4		11	2	21
Brown Creek	2	6	2			10	2	23

Trail Project Selection Matrix (Sorted)

	Qualifying Deficiency (select all that apply and rank it on the severity scale shown)							
Trail Project	Visitor Safety 1-10	Resource Protection 1-10	Preservation of Investment 1-7	Visitor Conveinence1-5	New Trail Construction 1-3	Total Matrix Points	Trail Class	Trail Class Points
Elk Prairie	8	7	5			20	1	38
James Irvine	10	5	5			20	1	32
Foothill	10	6	4			20	2	25
Ten Taypo	8	10	2			20	3	18
Rhododendron	5	6	3	2		16	3	18
West Ridge	5	6		4		15	3	19
South Fork	8	7				15	3	14
Ossagon	5	9				14	2	20
Cathedral Trees			7	4		11	2	21
Brown Creek	2	6	2			10	2	23
Little Creek		8		2		10	4	5
Clintonia			6	2		8	3	15
Revelation			7			7	1	42
Superintendent					2	2	2	22

Once the trail projects are prioritized they can be scheduled



The scheduling of trail projects must account for a number of variables

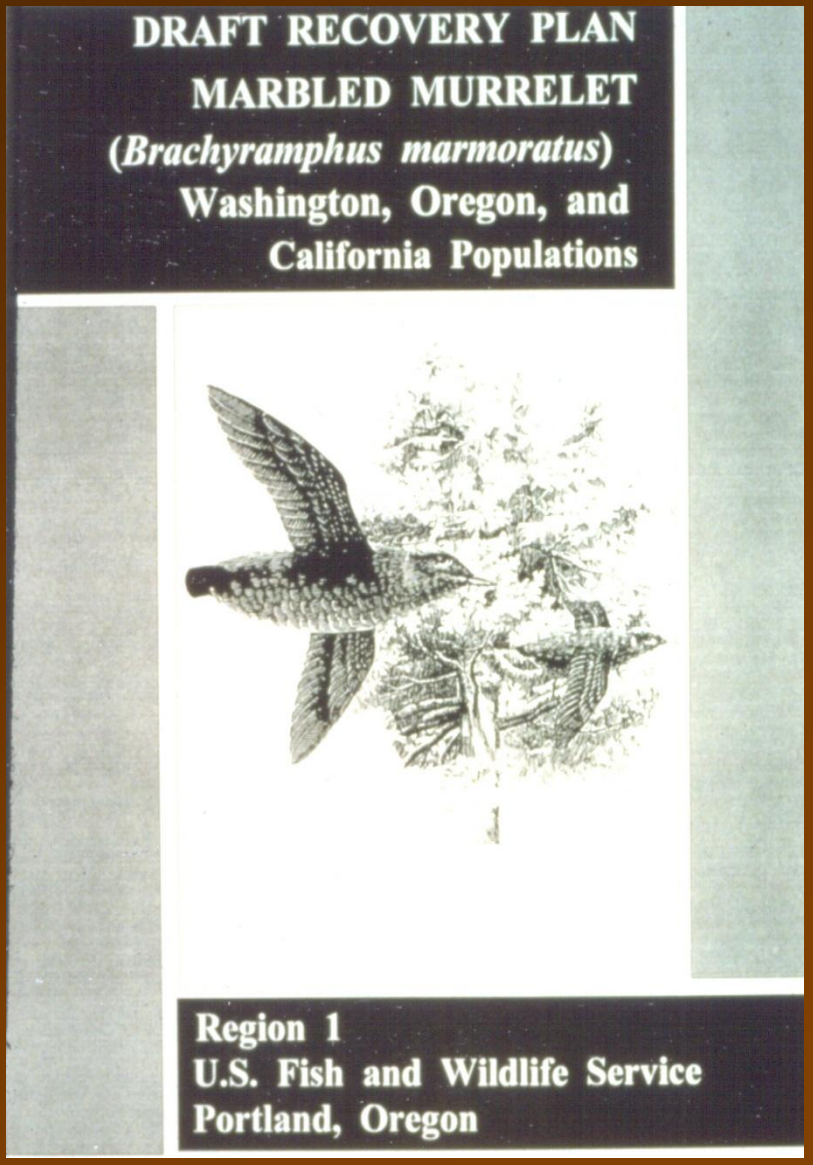
Visitor use patterns

Weather

Soil moisture conditions

Project logistics and access

Rare and endangered species restrictions

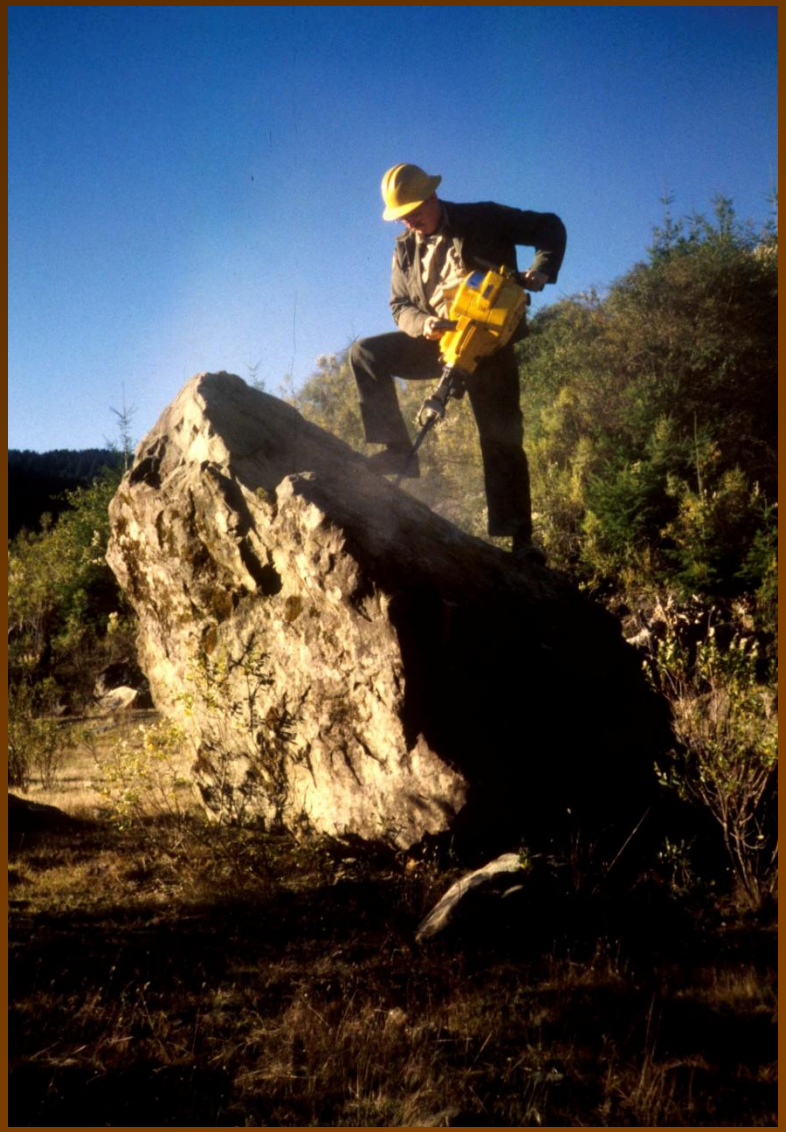


Labor source availability

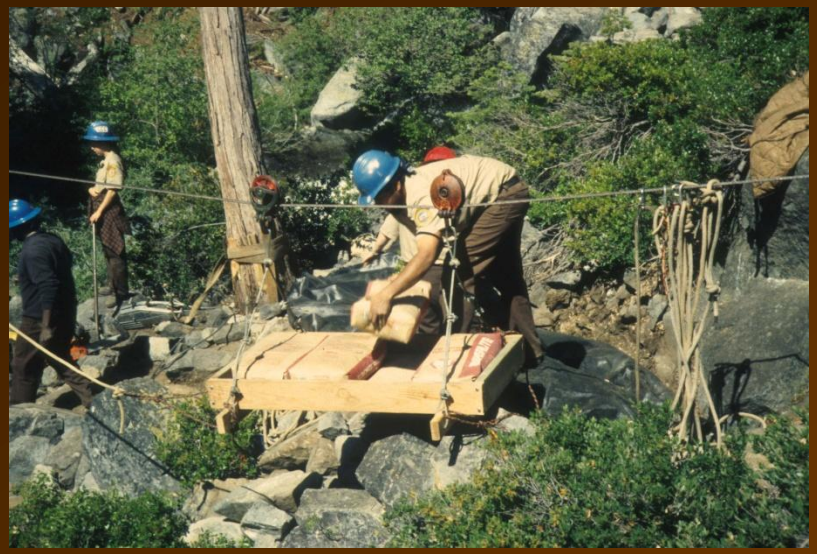
Matching project difficulty with the skill level of labor sources

Meeting crew development and training needs

Equipment and specialized tool support must also be scheduled



Materials and tools need to be secured in advance of the project start



Skilled and experience supervision is needed to provide project organization and efficiency, skill development and quality control

Completed trail projects are inspected and inventoried

Revise trail logs and maintenance budget information

SCHEDULE FOR MAINTENANCE ☑ **OR** **HOUSEKEEPING** ☐

NAME OF FACILITY: Overlook | FEET: 363 | MI: 0.1 | WIDTH: 3 | FACILITY NO.: 123-F-2-03-1-002

JOB DESCRIPTION	DAILY TO ANNUAL CYCLE: PERSON HOURS DAILY TO ANNUAL		YEARLY TOTAL PH	YEARLY TOTAL MAT'L	2 TO 5 YEAR CYCLE: 2 YR	3 YR	4 YR	5 YR	NEXT 3 F.Y. SCHEDULED	TOTAL PH	TOTAL MAT'L	PERSONAL SERVICES: Class	PERSON HOURS
Safety Inspection	363	Feet Divided By 2 mile per Hour	0.03									PMS	0.03
123-20001-01-01		Hiking time or 10560 feet											
5002													
Yearly Brushing	363	Feet Divided by 500 feet per person hour	0.73	Contract		CCC		Contract	$13.00 per hour				
123-20009-02-01	1	year cycle between brushing		$10.62									
		Hiking and Travel Time	0.09										
5005									Planning and Supervison Hours			PMW II	0.12
Slough and Berm Maintenance	363	Feet Divided by 75 feet per person hour	0.97	Contract		CCC		Contract	$13.00 per hour				
123-20009-03-01	5	year cycle		$14.16									
		Hiking and Travel Time	0.12										
5006									Planning and Supervison Hours			PMW II	0.16
Down Tree Removal	0	Number of Down Trees from trail log divided by trail Age											
123-20009-04-01	20	Trail Age											
	0	Yearly Average of Down Trees		Contract		CCC		Contract	$13.00 per hour				
5008		times average of 1 hour per tree	0.00	$0.00									
		Hiking and Travel Time	0.00						Planning and Supervison Hours			PMW II	0.00
Miscelleanous Logging Out and Brushing Supplies	$1.58	Misc clearing and brushing supplies and equipment. 1 brush blade per mile plus saw chain and fuel.		$1.58									
Trail Reroute and Reconstruction	363	1% of trail tread on average											
	4	feet yearly divided by 7 feet per		Contract		CCC		Contract	$13.00 per hour				
123-20015-01-03		person hour equals hours annually	0.52	$7.58									
		Hiking and Travel Time	0.06										
5020									Planning and Supervison Hours			PMW II	0.09
ANNUAL TOTAL MATERIAL COST ALL PAGES:				**$117.19**					**TOTAL PERSON HOURS ALL PAGES**				**0.66**

TOTAL EQUIPMENT COSTS- FROM PAGE 4: $0

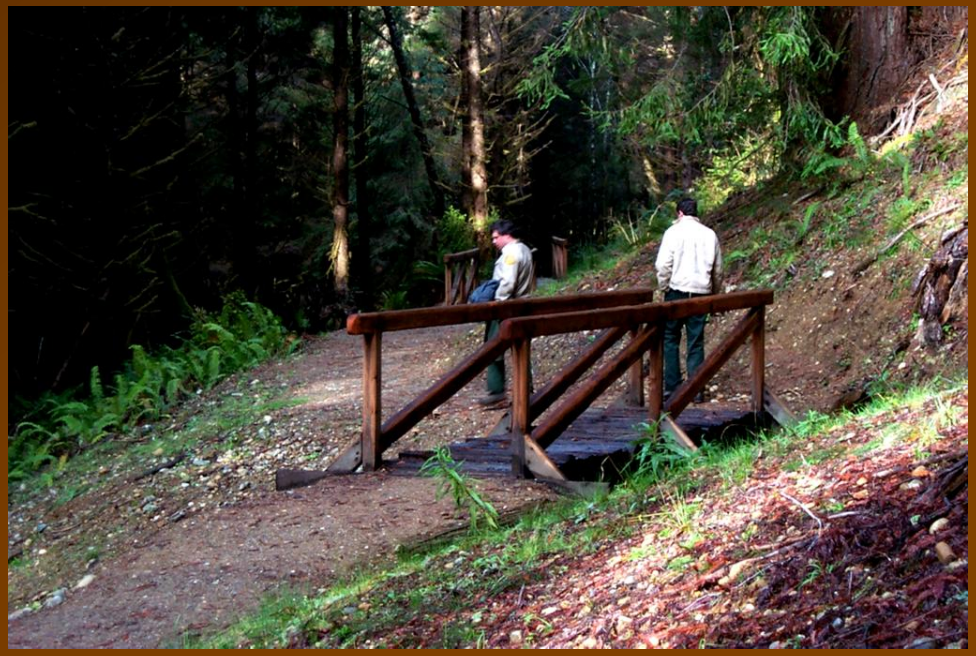
SCHEDULE

PREPARED BY: meb

DATE: 2/20/02

Establish monitoring sites to evaluate project effectiveness

Evaluating projects is a key component of adaptive management and developing best management practices



The trail management process requires :

- Classifying and prioritizing trails
- Developing trail standards
- Inventorying and assessing trails
- Determining the sustainability and maintainability of each trail
- Quantifying trail maintenance and rehabilitation cost
- Prioritizing and scheduling trail projects
- Securing labor sources, materials and tools
- Providing supervision, training and quality control

The trail management process requires :

- Performing post project inspections and inventories
- Monitoring and evaluating completed projects
- Continually adapting and improving trail maintenance and construction practices